

Recurrent Laryngeal Nerve Injury in Endoscopic Hemithyroidectomy

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ABSTRACT

Objective: To find the frequency of recurrent laryngeal nerve damage in endoscopic thyroidectomy.

Study design: Cross sectional descriptive study

Place & Duration of study: Ward 25, Jinnah Postgraduate Medical Centre, Karachi, Pakistan from January 2018 to January 2021.

Methodology: Eighty patients of solitary thyroid nodules who fulfill inclusion criteria were divided alternatively into endoscopic and open hemi thyroidectomy groups. Patients were assessed for recurrent laryngeal nerve injury in the evening and after 24 hours of surgery by quality of voice. Those patients whose voice is normal discharge on 2nd day while others follow fortnightly until 3 months.

Results: There was no recurrent laryngeal nerve injury encountered in group A while in group B 4 (10%) transient recurrent laryngeal nerve injuries were encountered. All injuries were recovered within 3 months post operatively. Out of 4 recurrent laryngeal nerve injuries 3 (75%) on left side (left hemi thyroidectomy) while 1 (25%) on right hemithyroidectomy. 2 (50%) recurrent laryngeal nerve injuries in patients when surgery time was approximately 3 hours.

Conclusion: Endoscopic thyroidectomy is safe, feasible and emerging minimal invasive technique to remove the thyroid gland without visible scar.

Keywords: Recurrent laryngeal nerve, Endoscopic thyroidectomy, Solitary thyroid nodule

INTRODUCTION

Enlargement of thyroid gland (goiter) is one of the most common Endocrine pathology admitted in Surgical wards. This enlargement is associated with either euthyroidism, hyper or hypothyroidism. ¹ Iodine deficiency and genetic factors are leading culprits responsible for goiter. A data published by Global Iodine Status 2011 indicated that more than 1.88 billion people including 241 million children would not intake sufficient iodine. ² Pakistan has reported greater incidence of iodine deficiency goiter in northern areas. ³

Goiter may be diffusely enlarged or having nodule (nodules). Surgery is the treatment of choice in nodular goiter either Solitary thyroid nodule or Multinodular goiter ⁴, this include total thyroidectomy or hemi thyroidectomy. Most common complications encountered are hypoparathyroidism and recurrent laryngeal nerve injuries. Seroma, hematoma, bleeding, scar mark, and lifetime replacement of thyroxine increase the morbidity ⁵.

Among all, recurrent laryngeal nerve injury with subsequent post-operative vocal disability is one of the most feared complication⁶. There has been found that 5-8% patients have transient recurrent laryngeal nerve (RLN) injury while only 0.3-3% have permanent paraplegia during thyroidectomy⁷ but with visualization and use of modern sophisticated devices like electromyography endotracheal tube and peripheral nerve monitoring system the incidence of RLN injury has been significantly decreased⁸.

There are various techniques readily available to remove thyroid gland, the conventional open surgical approach and the endoscopic approach, including chest and breast approach ⁹ axillary or axillo-breast ^{10,11} and oral cavity approaches ¹² Each technique individually having advantages and disadvantages. Cong chen mata analysis reported the risk of RLN injury is more in endoscopic thyroidectomies than open thyroidectomies despite by magnified view during endoscopy ¹³ The aim of this study is to find the frequency of nerve damage in endoscopic thyroidectomy.

METHODOLOGY

Eighty patients of Solitary thyroid nodule were enrolled in this comprehensive study from January 2018 to January 2021. Patients fulfill the inclusion and exclusion criteria were divided into two

groups alternatively. Both groups have 40 patients. Group A underwent Open hemi thyroidectomy while group B underwent endoscopic hemi thyroidectomy.

In order to avoid bias and generates standardization we use precise inclusion criteria; includes Thy-2 solitary thyroid nodule less than 3cm, Females ages between 20-30 years and BMI 18.5-24.9. Thy 1, 3, 4, 5, Multinodular, diffuse goiter, male patients and patients with previous neck and thyroid surgery were excluded from the study. All the patients were admitted in ward 25, Jinnah Postgraduate Medical Centre, Karachi, Pakistan through outpatient department, after taking history and necessary workup for surgery including direct or Indirect Laryngoscopy and Calcium levels, patients were informed regarding the nature of surgery and written consent were taken. All hemi-thyroidectomies were performed by single Surgeon.

Both procedures are carried out under General anesthesia, after vitals stabilization, hemodynamically optimization, biochemical evaluation and taking written and informed consent. Patients were followed in evening and after 24 hours of surgery to assess recurrent laryngeal nerve injury by examining quality of voice. Those patients whose voice is normal discharge on second day. Patients having change in voice observe fortnightly for 3 months until their voice was normal and direct laryngoscopy confirm normal mobility of vocal cord. Data was collected as predesigned Performa and analyzed by using statistical software.

Steps for open Hemi thyroidectomy: After positioning the patient in Rose position (i.e. Reverse trendlenberg with head elevation at 15 degrees to avoid venous congestion, sand bags at level of acromion process of shoulder blades and head rings to provide more anterior location of thyroid gland for better surgical access and visualization) Patient was painted by pyodine from chin to suprasternal notch and draped. Collar incision was made 2cm above the sternal notch from anterior border of sternocleidomastoid muscle to opposite sternocleidomastoid muscle. Skin, subcutaneous tissue and Platysma muscle incised, flaps raised (superior one till thyroid cartilage and inferior till sternal notch), cervical fascia incised vertically at midline anteriorly and strap muscle retracted laterally to find the thyroid lobe. Superior pole of diseased thyroid gland that has to be resected tied and divided. RLN and parathyroid glands identified and preserved and

thyroid lobe resected. Redivac suction drain placed and wound closed.

Steps for endoscopic hemi-thyroidectomy: Endoscopic thyroidectomy was performed in supine position. The neck is slightly extended by placing sand bag between scapulas and arm of the surgery side was extended. Three ports placed, 10 mm for camera (1st port) lateral to nipple at anterior axillary line, 5mm working port (2nd port) medial to breast and 5mm (3rd port) working port at deltopectoral groove. CO2 gas was used at pressure of 6 mm Hg in this surgery. A working space is created anterior to Pectoralis major muscle by diathermy hook to reach the neck. When entered in the neck retract the sternocleidomastoid muscle laterally, split the strap muscles and identify the thyroid lobe. Thyroid lobe was mobilized by pushing anteriorly, divides the tissues posteriorly adherent to trachea by ligasure from inferior to superior pole and finally separated from opposite lobe. Both parathyroid glands and recurrent laryngeal nerve identified and saved. Thyroid Lobe was removed after securing hemostasis and placement of redivac suction drain through 3rd port wound.

RESULTS

Eighty patients underwent hemi-thyroidectomy by open conventional and minimally invasive endoscopic means out of which 40 patients underwent open lobectomy and isthmusectomy while remaining 40 patients selected by randomized alternating method underwent through endoscopic approach. The study include female individual with age group ranges minimum between 21 and maximum 30 the mean for group A individuals were 23.77+/-5.54 and group B were 24.82+/-3.09.

BMI was calculated with minimum ranges between 18.5 and maximum ranges between 24.9 the mean for group A were 22.28+/-1.86 and group B were 22.03+/-1.65. Nodular size minimum ranges from less than 1 cm to maximum upto 3cm. In group A mean of nodular size was 1.97+/-0.77 and in group B mean was 1.85+/-0.75 cm

Time duration for both surgeries depends on expertise of surgeons however for group A it was no longer exceeded for 1 hour and minimum time taken for open lobectomy was 30 minutes. For group B minimum time taken will be 1 hour 40 minutes and maximum till 3 hour.

For group A there was no recurrent laryngeal nerve injury encountered. In group B 4 (10%) transient recurrent laryngeal nerve injuries were encountered which were recovered within 3 months post operatively. Out of 4 recurrent laryngeal nerve injuries 3 (75%) on left side (left hemi thyroidectomy) while 1 (25%) on right hemithyroidectomy. 2 (50%) recurrent laryngeal nerve injuries in patients when surgery time was approximately 3 hours.

DISCUSSION

Huscher was the pioneer of Endoscopic thyroidectomy¹⁴ Endoscopic thyroidectomy is equally safe as open thyroidectomy¹⁵. In China and South Korea they routinely performed Endoscopic thyroidectomy for micro papillary thyroid carcinoma¹⁶ We started endoscopic thyroidectomy via chest approach in 2017 in our unit.

RLN identification is difficult in endoscopic thyroidectomy due to small space and two dimensional view¹⁷. In both techniques we identified and preserved the RLN. Transient nerve injury were mainly observed in endoscopic hemi thyroidectomy as compare to open method may be due to heat production in closed compartment by coagulating and cutting devices. Owaki reported that energy devices should not be in contact with RLN immediately after its use as it causes thermal injury. He recommended the possibility of usage of ultrasonic coagulating and cutting devices 3 mm away for RLN and not more than 20 seconds at a time.¹⁸

Four patients (10%) has transient RLN injury during endoscopic hemi thyroidectomy which is almost similar to Mariam 13.62%¹⁹ and Ritah 7.96%²⁰ but significantly lower than Chung et al reported that 25.2%²¹ Tan et al also supported the Chung that thermal damage produced by energy devices is responsible for

RLN injury²¹. This thermal damage may be due to contact of nerve with hot instruments, heat produce by the instruments and may be due to heat produced by telescope. The small amount of heat produced causes significant increase in the temperature of this narrow closed space sufficient to cause recurrent laryngeal injury. In contrary to that Shi Chang reported 1(0.83%) recurrent laryngeal nerve injury in 120 endoscopic thyroid surgeries due to accidental contact of harmonic blade to nerve.²² Dionigi reported suction, traction and physical compression can cause recurrent laryngeal nerve damage. In addition to that Anuwong and Lang reported the higher incidence of recurrent laryngeal injury by endoscopic approach is due to different surgery approach.^{23,24}

Right recurrent laryngeal nerve is passing anterior to tracheoesophageal groove while left is in groove that's why right recurrent laryngeal nerve more prone to injure in open thyroidectomy. The opposite scenario find in endoscopic thyroidectomy where left recurrent laryngeal nerve is prone to injure by traction²⁰ due to its long course same as in this study where 3(75%) out of 4 transiently injured on left side. Two(50%) out of 4 nerve injuries reported in this study when surgery time was approximately 3 hours. This may be due to excessive use of energy devices, more suctioning, instrumentation and manipulation during prolong surgery.

Sun proposed that by using intraoperative neural monitoring surgeon avoid RLN palsy²⁵ Bin used Laryngeal neuro monitoring for nerve identifications and claim nerve injury incidence was decreased from 7.6 %to 1.3%.²⁶ Majority of surgeons recommended use of intraoperative recurrent laryngeal monitoring devices to identify and map the nerve during surgery that significantly reduced the incidence of recurrent laryngeal nerve injury. Due to unavailability of these sophisticated devices in our setup we were not able to use.

CONCLUSION

Transient nerve injuries are more common with endoscopic techniques but there was no significant difference between permanent RLN. It avoid scar on neck and should be considered in young females which avoid traditional open thyroidectomy due to scar.

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